



PPD / EED / Infrastructure Group / D0

**D0 Procedure / Hazard Analysis Document**  
**D0\_ELE\_MUO\_002**

**Remove / Replace Level 1 Muon Power Supply Chassis**

Date: 30-Jul-07

Latest revision: 21-Aug-07

**Prepared By:** Michael S. Matulik

**Safety Approval By (date):** (as necessary)

**Personal Protective Equipment:** (Check protective equipment required for the job.)

- |  |                                       |   |
|--|---------------------------------------|---|
| <input type="checkbox"/> Safety glasses                            | <input type="checkbox"/> Side shields | <input type="checkbox"/> Chemical splash goggles              |
| <input type="checkbox"/> Hearing Protection                        |                                       | • Hard Hats   |
| <input type="checkbox"/> 3.0 Braising goggles                      |                                       | <input type="checkbox"/> Impact goggles                       |
| <input type="checkbox"/> Face shield                               |                                       | <input type="checkbox"/> Rubber apron                         |
| <input type="checkbox"/> Leather gloves                            |                                       | <input type="checkbox"/> Hot/Cold thermal protective gloves   |
| <input type="checkbox"/> Chemical resistant gloves (specify type): |                                       | <input type="checkbox"/> Respirators                          |
| <input type="checkbox"/> Other required PPE (specify):             |                                       | <input type="checkbox"/> Fall protection equipment (specify): |

Proper radiation dosimetry required for collision hall access.

Log survey meter (LSM) required during controlled access to D0 collision hall.

**Work Plan History Information:** (List any lessons learned accidents from this job, tips from previous jobs)

**Overview:**

Power for the various electronics modules used in the D0 Level 1 Muon Detector sub-system is delivered by one of four different types of Power Supply Chassis. All are commonly referred to as "L1 Muon Power Supplies." Besides the differing voltage / current sourcing capabilities; the 4 types of Level 1 Muon Power Supply Chassis are identified with a letter (A, B, C or D) printed on a sticker attached to each chassis. While all 4 chassis types are exactly the same size, they are not interchangeable – the output cabling found at a specific chassis location will only correctly connect to the type of chassis that belongs in that location. As most of the Level 1 Muon Power Supply Chassis are located in the platform area under the D0 Detector, it behooves one to make sure that the proper spare supply is selected prior to transferring it to its installation location. The

type. Chart found in Table 1 indicates the relationship between installation location and chassis type.

Location of Level 1 Muon Power Supply Chassis	Chassis Type
PE02	A
PE04	A
PE05	B
PE09	C
PE10	D
West	B
M120	B

Table 1. Level 1 Muon Power Supply Chassis location relationship to chassis type.

Images in Figures 1 and 2 show the Front Panel and Rear Panel views (respectively) of a Type A Muon Level 1 Power Supply Chassis.

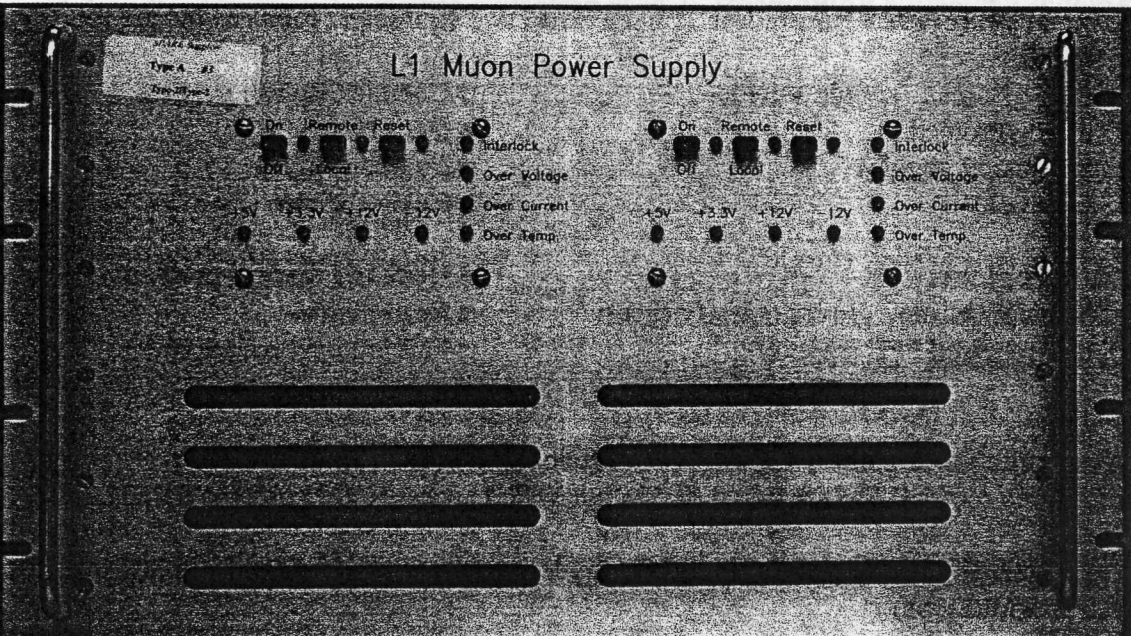
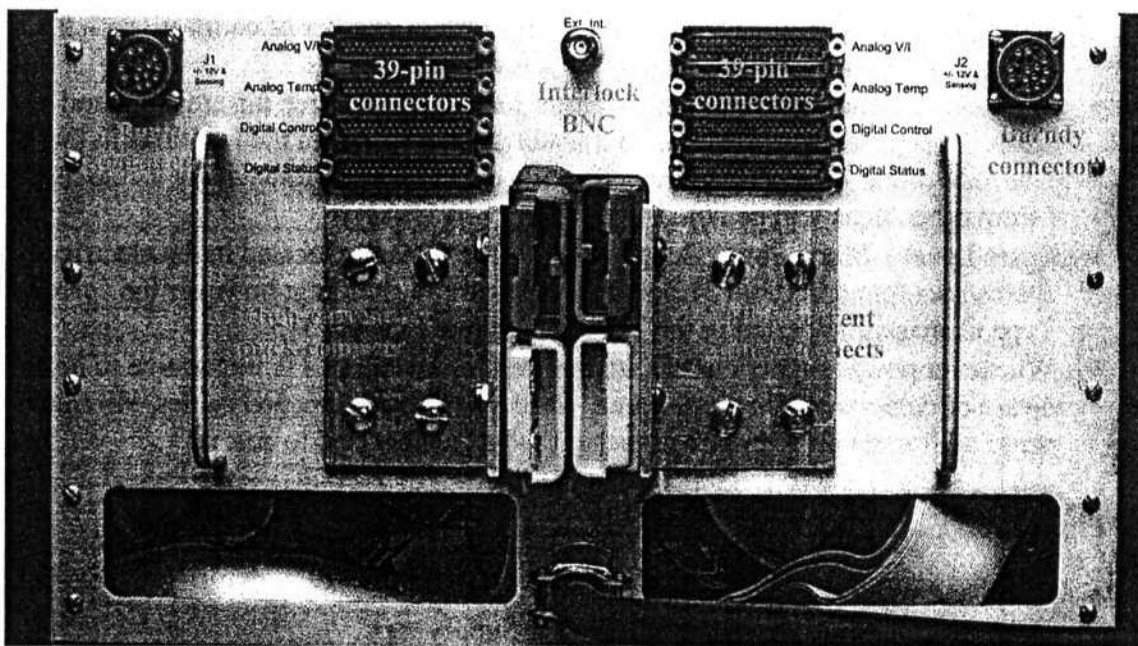


Figure 1. Level 1 Muon Power Supply Chassis (Front Panel).



**Figure 2. Level 1 Muon Power Supply Chassis (Rear Panel).**

Most Level 1 Muon Power Supply Chassis contain two sets of identical power supplies. Except for sharing AC power, the two power supplies are independent.

### **Training Requirements:**

- Appropriate training to be issued a key to the D0 Collision Hall.
- Basic Electrical Safety – FN000235/CR (minimum).
- D0 Hazard Awareness.
- D0 Collision Hall Crane Qualification (to lower / raise chassis to / from collision hall floor).

### **Important Information:**

- A minimum of two people are required to perform this procedure. One must be a member of the Level 1 Muon Detector group. One must have the D0 Collision Hall Crate Qualification.
- Overall dimensions for a Level 1 Muon Power Supply Chassis are 10 x 19 x 22 inches. They vary in weight from 35 pounds (Type B) to 80 pounds (Type D). As it will be necessary to lift these chassis at some point, this procedure requires a minimum of two people – who will lift the chassis together when necessary. Lifting and carrying a Power Supply Chassis should be a safe and coordinated activity; discuss the intended path for carrying the chassis before moving it (clear possible trip hazards where possible), determine who will lead - who will follow and lift and lower the chassis in unison.
- While there are 4 types of Level 1 Muon Power Supply Chassis, the differences between them, related to removing / replacing, are not significant. This procedure

assumes a power supply chassis with the maximum number of connections – the specific chassis being replaced may have fewer.

- The Level 1 Muon Power Supply Chassis are located in three different general areas. This procedure is written to transfer chassis to / from the locations in the East side of the D0 Platform area. Specific differences in transferring a chassis to / from other areas will be noted.
- Spare Level 1 Muon Power Supply Chassis are typically located in the electrical spares area found in room 312 in the D0 Assembly Building; however the spare Type C chassis is located in the Test Stand found in room 313.
- Whenever power supply chassis are removed or installed, it is imperative to be aware of detector cabling in the area. Disconnected or damaged cables will likely cause additional detector downtime and subsequent access to correct.

### **Required Tools:**

- Paper and writing utensil.
- Collection of Failed Level 1 Muon Power Supply tags.
- Hydraulic lift cart.

### **Procedure:**

Ensure that the D0 Control Room personnel responsible for Level 1 Muon Detector operation are aware of replacement prior to entering D0 Collision Hall.

#### **Chassis Transfer Procedure (to D0 Collision Hall Pit):**

- With the hydraulic lift cart table positioned at the proper elevation, slide the desired Level 1 Power Supply Chassis from the spare electronics shelf it's resting on onto the lift cart table. The lift cart should be prevented from rolling while sliding the chassis onto the table.
- Lower the table to its lowest position for transfer.
- Preposition a wheeled cart just outside the door to the D0 Collision Hall. (If this supply is destined for the location in the 1<sup>st</sup> floor Moving Counting House, it can remain on the lift cart until the lift cart is positioned in front of M120 with the table at the proper elevation.)
- Roll lift cart with chassis to 1<sup>st</sup> Floor Fixed Counting House (1 FCH). Raise table to convenient elevation. Two people lift chassis, carefully carry it to and then onto wheeled cart. Note that assistance will be required to walk through the normally closed door-way leaving 1 FCH.
- Using appropriate access techniques enter D0 Collision Hall labyrinth, rolling cart with chassis. Locate wheeled cart as close to hoist access as reasonable.
- Two people lift chassis from cart, carefully carry it to and position it in a location that permits access by a Collision Hall hoist.
- Using appropriate rigging techniques connect chassis to Collision Hall hoist and lower to collision hall floor. Note this operation may only be executed by a person on the list of people approved and qualified to operate hoist.

- Disconnect chassis from rigging.
- Two people lift chassis from resting position and carefully carry it near it's installation location.
- Note problems with Power Supply Chassis to be removed on a Failed Level 1 Muon Power Supply tag (Figure 3).

<h1 style="margin: 0;">FAILED</h1> <p style="margin: 0;">Level 1 Muon Power Supply</p> <p style="margin: 0;">Date: _____</p> <p style="margin: 0;">Initials: _____</p>	Comments / suspected problems:
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**Figure 3. Failed Muon Level 1 Power Supply Tag**

During certain periods of Detector inactivity, the East access point of the D0 Collision Hall will be open. It is possible to take advantage of this situation to simplify the Chassis Transfer Procedure. With assistance from the D0 Mechanical Support Group, one can have a Level 1 Power Supply Chassis lowered from the hydraulic lift cart in the D0 High Bay area onto a wheeled cart pre-located on the Collision Hall Pit floor. The wheeled cart can then be rolled directly into the Collision Hall through the East access point.

#### Removal Procedure:

- Press each of the two “On Off” buttons on the front panel of the Level 1 Muon Power Supply Chassis until LED to the right of the buttons illuminates red, indicating that the power supplies inside are off.
- Turn off the appropriate circuit breaker on the Power Distribution Chassis.
- Remove the Plexiglas / Lexan cover from the rear of the rack housing the Power Supply Chassis by unscrewing the “buttons” holding it in place.
- Following the AC power cord from the Level 1 Muon Power Supply Chassis (by hand) to Power Distribution Chassis, disconnect 208Vac 3-phase plug. Note that it might be necessary to remove the Plexiglas / Lexan covers from adjacent racks to follow the path of the AC power cord.
- Partially remove the Power Supply Chassis from its installed location to facilitate access to the connectors on the rear panel.
- Note the location of the cables to the various connectors on the rear panel of the Level 1 Muon Power Supply Chassis.
- Disconnect (in most convenient order) the connectors from the rear of the Power Supply Chassis:
  - Both sets (of two) high-current quick-disconnects.

- Both circular Burndy connectors.
  - Eight 39-pin D connectors. (Do not pull on ribbon cables to disconnect these connectors, damage and / or intermittent connections are possible. Leverage the connector apart using a fingernail or small screwdriver if necessary.)
  - Interlock BNC.
- Slide the chassis to be replaced from its installed location. Observe the removal to ensure that cables in the rack are not caught on the chassis or otherwise disturbed.
  - Two people lift chassis and carefully carry it away from platform area.

#### Installation Procedure:



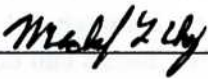
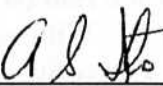
- Two people lift replacement chassis from resting place and carefully carry it to the installation location.
- Carefully slide the chassis partially into the installation location. Observe the installation to ensure that cables in the rack are not caught on the chassis or otherwise disturbed.
- Connect (in most convenient order) the connectors on the rear of the Power Supply Chassis.
  - Both sets (of two) high-current quick-disconnects.
  - Both circular Burndy connectors (refer to notes to ensure correct connections).
  - Eight 39-pin D connectors (refer to notes to ensure correct connections).
  - Interlock BNC.
- Reconnect AC cord. Where possible, pre-twist the AC power cord so that after insertion, cable tension keeps the cord plug from loosening.
- Re-install any Plexiglas / Lexan covers removed from adjacent racks.
- Turn on the appropriate breaker on the Power Distribution Chassis.
- Press each of the “Reset” buttons. The LED to the right of each button should be illuminated green. Press each of the “Remote Local” button until the LED to the right of the button illuminates red (indicating the power supply is controlled locally). Turn on each of the two supplies by pressing each of the “On Off” buttons on the front panel until the LED to the right of each button illuminates green.
- After verifying that all voltage LEDs and none of the alarm LEDs on the front panel of the Power Supply Chassis are illuminated, press each of the “Remote Local” buttons until the LED to the right of the button illuminates green (indicating that the power supply is controlled remotely).
- Re-install Plexiglas / Lexan cover in Power Supply Chassis Rack.

#### Chassis Transfer Procedure (from D0 Collision Hall Pit):

- Two people lift the Power Supply Chassis from its resting place, carefully carry it to and position it in a location that permits access by a Collision Hall hoist.
- Using appropriate rigging techniques connect chassis to Collision Hall hoist and raise chassis to Collision Hall sidewalk. Note that this operation may only be executed by a person on the list of people approved and qualified to operate hoist.
- Disconnect chassis from rigging.
- Two people lift chassis, carefully carry it to and position it onto the wheeled cart previously left in the Collision Hall.
- Using appropriate access techniques; exit the D0 Collision Hall labyrinth, rolling the cart with chassis.
- Survey Power Supply Chassis with Frisker.
- Two people lift chassis, carefully carry it to and position it on the hydraulic lift cart. Note that assistance will be required to walk through the normally closed door-way entering 1 FCH.
- Lower the table on the hydraulic lift to its lowest position for transfer.
- Roll lift cart with chassis to technicians area on 3<sup>rd</sup> Floor Fixed Counting House.

During certain periods of Detector inactivity, the East access point of the D0 Collision Hall will be open. It is possible to take advantage of this situation to simplify the Chassis Transfer Procedure. The Power Supply Chassis can be carefully carried to and positioned on a wheeled cart pre-located in the Collision Hall (at floor level). This cart can be rolled through the East access point into the D0 Pit. With assistance from the D0 Mechanical Support Group, one can have the Level 1 Power Supply Chassis raised from the cart and onto the hydraulic lift cart in the D0 High Bay area.

My supervisor has reviewed this hazard analysis with me and I understand the hazards and required precautionary actions. I will follow the requirements of this hazard analysis or notify my supervisor if I am unable to do so. I understand that there are Environmental, Safety and Health Professionals on staff if I need further assistance or clarification.

Name and ID (please print)	Signature	Date
JOHN FOGLESONG		12 OCT 07
Michael S. Matern		12-007-003
Michael L CHERRY		22 Oct 07
A. S. Ito		10/22/07